

IN THE CLAIMS:

Please amend the claims as follows.

- 1 (Original) A fault tolerant control method for recovery of a fault in a storage apparatus that includes
 - a channel connection system for connection to a host apparatus,
 - a channel adapter for receiving a command from said host apparatus through said channel connection system,
 - another channel connection system for connection to said host apparatus,
 - another channel adapter for receiving a command from said host apparatus through said another channel connection system,
 - a cache memory, connected to said channel adapter, for temporarily storing data to be sent to said host apparatus,
 - another cache memory, connected to said another channel adapter, for temporarily storing data to be sent to said host apparatus,
 - a shared memory, connected to said channel adapter, for storing data to control said data stored in said cache memory,
 - another shared memory, connected to said another channel adapter, for storing data to control said data stored in said another cache memory, and

wherein said channel adapter and said shared memory are connected to each other with a first plurality of connecting means, said channel adapter and said another shared memory are connected to each other with a second plurality of connecting means, said another channel adapter and said shared memory are connected to each other with a third plurality of connecting means, and said another channel adapter and said another shared memory are connected to each other with a fourth plurality of connecting means, comprising the steps of, if a fault occurs in access from said channel adapter or said another channel adapter to said shared memory or said another shared memory of said storage apparatus:
 - accessing said shared memory or said another shared memory by use of whichever of said connecting means that was not used when said fault was generated;

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determining a fault location from a result of the accessing step; and isolating said fault location.

2. (Original) The fault tolerant control method as claimed in claim 1, further comprising the steps of, if said fault occurs:

gathering information about said fault and, if a fault location is obvious, blocking said fault location;

if said fault location is not obvious, retrying said access;

if the said fault occurs again, accessing said shared memory or said another shared memory by use of another connecting means;

determining a fault location by matching a result of the accessing step with a table of fault location determination; and

isolating said fault location.

3. (Original) The fault tolerant control method as claimed in claim 1, further comprising the steps of, if said fault occurs in accessing said shared memory:

attempting access of said shared memory from said channel adapter by use of a first one of said first plurality of connecting means;

attempting access of said shared memory from said channel adapter by use of said a second one of said first plurality of connecting means; and

attempting access of said shared memory from said another channel adapter by use of a first one of said third plurality of connecting means.

4. (Canceled)

5. (Currently amended) The storage apparatus as claimed in claim 4, A storage apparatus comprising:

a channel connection system for connection to a host apparatus;

a channel adapter for receiving a command from said host apparatus through said channel connection system;

another channel connection system for connection to said host apparatus;

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another channel adapter for receiving a command from said host apparatus through said another channel connection system;

a cache memory, connected to said channel adapter, for temporarily storing data to be sent to said host apparatus;

another cache memory, connected to said another channel adapter, for temporarily storing data to be sent to said host apparatus;

a shared memory, connected to said channel adapter, for storing data to control said data stored in said cache memory;

another shared memory, connected to said another channel adapter, for storing data to control said data stored in said another cache memory;

wherein said channel adapter and said shared memory are connected to each other with a first plurality of connecting means, said channel adapter and said another shared memory are connected to each other with a second plurality of connecting means, said another channel adapter and said shared memory are connected to each other with a third plurality of connecting means, and said another channel adapter and said another shared memory are connected to each other with a fourth plurality of connecting means; and

wherein said channel adapter includes a processor, and if a fault occurs in accessing said shared memory, said processor causes attempted access of said shared memory from said channel adapter by use of a first one of said first plurality of connecting means, access of said shared memory from said channel adapter by use of said a second one of said first plurality of connecting means, and access of said shared memory from said another channel adapter by use of a first one of said third plurality of connecting means, to isolate said fault.

6. (Currently amended) The storage apparatus as claimed in claim 4, A storage apparatus comprising:

a channel connection system for connection to a host apparatus;

a channel adapter for receiving a command from said host apparatus through said channel connection system;

another channel connection system for connection to said host apparatus;

another channel adapter for receiving a command from said host apparatus through said another channel connection system;

a cache memory, connected to said channel adapter, for temporarily storing data to be sent to said host apparatus;

another cache memory, connected to said another channel adapter, for temporarily storing data to be sent to said host apparatus;

a shared memory, connected to said channel adapter, for storing data to control said data stored in said cache memory;

another shared memory, connected to said another channel adapter, for storing data to control said data stored in said another cache memory;

wherein said channel adapter and said shared memory are connected to each other with a first plurality of connecting means, said channel adapter and said another shared memory are connected to each other with a second plurality of connecting means, said another channel adapter and said shared memory are connected to each other with a third plurality of connecting means, and said another channel adapter and said another shared memory are connected to each other with a fourth plurality of connecting means; and

wherein a processor of said channel adapter issues a locked access command to said shared memory when executing certain processing and executes unlocking after completion of said certain processing.

7. (Cancelled)

8. (Currently amended) The storage apparatus as claimed in claim 7, , A storage apparatus comprising:

a disk array for storing data;

a disk adapter for transferring said data from said disk array to a cache memory;

a channel connection system for connection to a host apparatus;

a channel adapter for receiving a command from said host apparatus through said channel connection system;

another channel connection system for connection to said host apparatus;

another channel adapter for receiving a command from said host apparatus through said another channel connection system;

said cache memory, connected to said channel adapter, for temporarily storing data to be sent to said host apparatus;

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another cache memory, connected to said another channel adapter, for temporarily storing data to be sent to said host apparatus;

a shared memory, connected to said channel adapter, for storing data to control said data stored in said cache memory;

another shared memory, connected to said another channel adapter, for storing data to control said data stored in said another cache memory;

wherein said channel adapter and said shared memory are connected to each other with a first plurality of connecting means, said channel adapter and said another shared memory are connected to each other with a second plurality of connecting means, said another channel adapter and said shared memory are connected to each other with a third plurality of connecting means, and said another channel adapter and said another shared memory are connected to each other with a fourth plurality of connecting means;

wherein said shared memory is also connected to said disk adapter with a plurality of connecting means; and

wherein a processor of said disk adapter issues a locked access command to said shared memory when executing certain processing and executes unlocking after completion of said certain processing.

9. (Canceled)

10. (Currently amended) The storage apparatus as claimed in claim 9, A storage apparatus comprising:

a disk array for storing data;

a cache memory for temporarily storing data when sending the same to a host apparatus;

a disk adapter for transferring said data from said disk array to said cache memory;

another cache memory for temporarily storing data when sending the same to said host apparatus;

another disk adapter for transferring said data from said disk array to said another cache memory;

a shared memory, connected to said disk adapter, for controlling said data stored in said cache memory;

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another shared memory; connected to said another disk adapter, for controlling said data stored in said another cache memory;

wherein said disk adapter and said shared memory are connected to each other with a first plurality of connecting means, said disk adapter and said another shared memory are connected to each other with a second plurality of connecting means, said another disk adapter and said shared memory are connected to each other with a third plurality of connecting means, and said another disk adapter and said another shared memory are connected to each other with a fourth plurality of connecting means; and

wherein said disk adapter includes a processor, and if a fault occurs in accessing said shared memory, said processor causes attempted access of said shared memory from said disk adapter by use of a first one of said first plurality of connecting means, access of said shared memory from said disk adapter by use of said a second one of said first plurality of connecting means, and access of said shared memory from said another disk adapter by use of a first one of said third plurality of connecting means, to isolate said fault.

11. (Currently amended) The storage apparatus as claimed in claim 9, A storage apparatus comprising:

a disk array for storing data;

a cache memory for temporarily storing data when sending the same to a host apparatus;

a disk adapter for transferring said data from said disk array to said cache memory;
another cache memory for temporarily storing data when sending the same to said host apparatus;

another disk adapter for transferring said data from said disk array to said another cache memory;

a shared memory, connected to said disk adapter, for controlling said data stored in said cache memory;

another shared memory; connected to said another disk adapter, for controlling said data stored in said another cache memory;

wherein said disk adapter and said shared memory are connected to each other with a first plurality of connecting means, said disk adapter and said another shared memory are connected to each other with a second plurality of connecting means, said another disk

adapter and said shared memory are connected to each other with a third plurality of connecting means, and said another disk adapter and said another shared memory are connected to each other with a fourth plurality of connecting means; and

wherein a processor of said disk adapter issues a locked access command to said shared memory when executing certain processing and executes unlocking after completion of said certain processing.

12. (Canceled)

13. (Currently amended) The storage apparatus as claimed in claim 12, A storage apparatus comprising:

a disk array for storing data;

a cache memory for temporarily storing data when sending the same to a host apparatus;

a disk adapter for transferring said data from said disk array to said cache memory;
another cache memory for temporarily storing data when sending the same to said host apparatus;

another disk adapter for transferring said data from said disk array to said another cache memory;

a channel connection system for connection to said host apparatus;

a channel adapter for receiving a command from said host apparatus through said channel connection system;

a shared memory, connected to said disk adapter, for controlling said data stored in said cache memory;

another shared memory, connected to said another disk adapter, for controlling said data stored in said another cache memory;

wherein said disk adapter and said shared memory are connected to each other with a first plurality of connecting means, said disk adapter and said another shared memory are connected to each other with a second plurality of connecting means, said another disk adapter and said shared memory are connected to each other with a third plurality of connecting means, and said another disk adapter and said another shared memory are connected to each other with a fourth plurality of connecting means;

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wherein said shared memory is also connected to said channel adapter with a plurality of connecting means; and

wherein a processor of said channel adapter issues a locked access command to said shared memory when executing certain processing and executes unlocking after completion of said certain processing.